many of their compounds, are combustible, being organic products, but these combustible properties are negatived in these permanent combinations with oxygen. A mass of mixed organic matter no sooner becomes exposed to atmospheric action within or near the tropics, than it commences a series of changes in conformity to the nature of its material, the gelatinous parts of the oceanic animals unite with oxygen in definite proportions, and become SILICA; silica is therefore the animal matter found in all species united with oxygen, in definite proportions of each; lime in like manner becomes oxydated or saturated *per se* with oxygen, being exhibited in its calcareous state; bodies united by the common base silica, or alumine, or both in union, remain united and enter into the more consolidated state in consequence of their absorbing and fixing oxygen; and every body, according to its homogeneous or mixed qualities, has peculiar powers of its own, all differing from each other in the quantity of oxygen they absorb, the rapidity with which they absorb it, and the proportion of caloric which they disengage from the oxygen absorbed. All rocks are therefore results of slow or rapid oxydation, or otherwise they are formed by the force of cohesion, the abstraction of oxygen, and lateral pressure; *no crystalline rock can possibly be formed by the heat of fusion.* Kerman found 32·42 grains of fixed air in 100 grains of marble; and the experiments of Dr. Priestley demonstrated the presence of fixed air in many mineral bodies. Thus, from 7 ounces of whiting, the most simple form of calcareous matter, he expelled 630 ounce-measures of air; from 3½ ounces of lime fallen in the air, he expelled 375 ounce-measures, of which about one-fifth was fixed air. These and innumerable experiments made in later times demonstrate that atmospheric air is the co-operative cause, and an essential ingredient of all rocks, stones, minerals, and earths, and that in its fixed state it constitutes a vast portion of this planetary body. The effect of an intense atmospheric heat upon a fossil bed is to oxidise the alkalies and alkaline earths exposed to its continuous influence, to convert clays by abstracting their hydrogen, into rock, and to render rock more opaque and sonorous by the gradual re-arrangement of its particles. The action of the atmosphere in this country has the effect of destroying rock by corroding its surface, or abstracting its oxygen from some one component of the rock; the action of the atmosphere in Upper Egypt is to form rock, to preserve it when formed, and in the slow progress of time to render it harder and more sonorous. Thus the ancient monuments of this country are preserved uninjured through a long succession of ages; but not so in Lower Egypt when exposed to the sea-breeze; here corrosion takes place, and all monumental stones suffer desquamation more or less. The white marbles on the heights of South America, although partially affected by running streams, are preserved from desquamation otherwise by atmospheric influences. A few hundred years pass away, and castles, palaces, and cathedrals built in this country moulder into dust.

Chemists are gradually, but unwillingly, acknowledging these truths, are gradually enlarging their conceptions of the organic origin of all inorganic bodies formed from, and perpetually united and uniting with, atmospheric air, and the luminous calorie and electric fluids which pervade and traverse it continually. It is everywhere present: the mine is no sooner opened, than, following the steps of the miner, it acts, and is immediately re-acted upon by the mineral substances composing the bed; interchanges of elementary constituents take place, its oxygen combines in variable proportions with the metals and semi-metals; and inflammable gases, held in mere mechanical union, are liberated and unite with its volumes: thus in numerous decompositions and re-combinations new results are generated, and former things are destroyed. It is from this admission of the atmospheric volumes that the choke-damp and explosive mixtures are liberated. Without atmospheric air the miner could not live—its presence and searching action too often bring destruction and desolation to wives and families. In vegetable earth atmospheric air is invariably present in its unfixed state; but when this earth passes into the state of clay, air enters into chemical combination with the plastic mass in its fixed state, changing with the changing mass, the excess being carried off with the hydrogen. In the first stage it rapidly corrodes and decomposes all animal and vegetable remains, causing them to pass into the state of earth; in the latter state its powers are strikingly manifest in the preservation of organic matter, and in causing it to assume the mineralized form.

SOCIETY OF ARTS.

APRIL 3.—William Pole, Esq. V.P., in the chair.

The secretary read a paper by Mr. C. Tetley, on certain phenomena of steam, and on his plan of economising fuel in the boilers of locomotive engines.

The evaporating power of a boiler, says Mr. Tetley, is dependant chiefly on three causes:—1, The amount of boiler surface exposed to the reception of heat; 2 (and very materially), on the shape of the boiler; and, 3, on the intensity of the heat. The heat derived from that part of the boiler immediately over and about the fire he calls (according to usage) "radiating heat;" while the heat derived from the tubes or flues he calls "carried heat." After detailing a very elaborate theory of certain phenomena of steam, he describes his improvement in boilers, for the rapid evaporation of water and for the economy of fuel, which consists of a division of the boiler into two or more compartments of different heating temperatures, having channels for feeding the compartments with water from that of those containing water of a lower temperature.

The first partition is placed vertically over the water space at the back of the boiler, the top of which reaches somewhat above the water line, and the bottom below the level of the fire-bars, but leaving a passage for the water beneath it.

The second partition reaches from the bottom of the tubular part of the boiler to a little above the level of the fire-box, and is removed but a short distance from the first partition. The third partition is placed in the middle of the tubular boiler, and, as the first, runs up, above the water level.

A communication is formed for a supply of water, by a pipe running from the compartment nearest the chimney-box into the middle compartment, the top of the pipe being just under the top water level, and the bottom of the pipe entering the middle compartment at or near the bottom of the boiler.

On evaporation taking place, the steam diffuses itself over the top of the partitions, thus maintaining the same pressure on the surface of all the water.

Evaporation commences in the compartment over the fire-box, and the water converted into steam is reinstated by the surface water from the second or middle compartments, which is delivered almost or entirely at the evaporating point.

In like manner the middle compartment is kept continually fed from the top layer of water in the third compartment, which is supplied by a pump in the usual way.

By this arrangement, a saving of fuel, equal to about 21 per cent., is obtained—the prevention of a deposit of sediment is effected—the steam is got up more rapidly; and the action of a float for regulating a feed apparatus is rendered much more certain.

Mr. Wroughton explained his self-acting glass ventilator, which consists of a mahogany vertical frame, 17 inches high and 14 inches wide, standing on a platform, 14 inches long and 18 inches wide. In the frame is fixed a plate of glass, in which are ten horizontal apertures, each 2½ inches long and ¼ inch wide. On the internal side of the glass are four vertical brass slides, in which work as many pieces of glass fixed in a brass case as there are apertures in the plate, but somewhat larger, in order entirely to cover them when necessary.

The two sets of glass covers are suspended from a small brass beam working on a pivot attached to the glass.

A small ivory piston, working with a nut and screw, in a glass bent tube, is attached to one set of glass covers. The glass tube contains a column of mercury altogether about 12 inches in length, but divided at top into two arms, over which are two vertically placed glass tubes about 10 inches in length, and bent over at the top and returning down to the bottom of and close to the first tubes; these tubes are filled with spirits of wine, which, when expanded by heat, acts in conjunction with the mercury (with which it is in contact), and elevates and depresses the glass covers so as to admit fresh air in proportion to the amount required to keep the temperature of the apartment at a fixed point, which is ascertained by a scale marked on the glass plate.

The society's repository was lighted for two hours and a half with six of Young's Vesta Lamps, at a cost of 9d. for a pint and a half of highly rectified spirits of turpentine. Two additional lamps would have rendered the lighting complete.

Several specimens of Messrs. Wood and Co.'s stamped wood, in imitation of rich carving, were placed in the Repository, as also one of Mr. Varley's single lever stage microscopes.

RAILWAY INTELLIGENCE.

The Lancaster and Carlisle Railway.—On Monday last, the surveyors and their assistants commenced marking out the line, which, in all probability, will be that adopted for the continuation of the railway from Lancaster to Carlisle. They started from the engine-house, and the route staked out is directly across the turnpike-road, thence behind Greenfield, and above the Bath Houses. The canal will be crossed at some distance from the aqueduct bridge; and a slanting bridge is to be built over the Lune, commencing about the Ladies'-walk, and to come out near Skirton Mill. It will then be carried through a portion of Slyne, and will be about half a mile from Kendal. The statement, that it was intended to take the line through the Kendal Fields, and then to cross the Lune near the Ford, is wholly without foundation. The bill has passed the House of Commons, and is now only waiting the sanction of the House of Lords, which will not be obtained until after the Easter recess, when the works will be immediately proceeded with. Mr. Locke and Mr. Errington are now in London, expediting the undertaking as much as possible.—*Lancaster Guardian.*

Atmospheric Railway.—The *Journal des Debats* publishes an analysis of the report of M. Mallet, the celebrated engineer, who was sent specially by the French government to study the system of atmospheric railroads at Dublin, and who states the advantage of that system to be, all danger of accidents from fire is avoided, an almost impossibility of the carriage running off the road, and the utter impossibility of a collision between two trains. All the objections raised against the atmospheric system have been examined by M. Mallet, and this distinguished mathematician asserts that none of them are insurmountable; but one of the principal advantages of this system consists in its preventing the necessity of levelling the soil according to the present method. M. Mallet has likewise made a comparative calculation of the expense of the two systems, and he demonstrates that the atmospheric plan offers an economy of 140,000f. per league, or 2,000f. British per mile. M. Mallet concludes his report by recommending the government to make a trial of the atmospheric system, which the *Journal des Debats* believes will be carried into effect.

Athens, a city not much larger than Liverpool or Bristol, and all whose inhabitants might have been lost in Syracuse, produced, within the short period of two centuries, reckoning from the battle of Marathon, a greater number of exquisite models in war, philosophy, patriotism, eloquence and poetry; in the semi-mechanical arts, which always accompany or follow them, sculpture and painting; and in the first of the mechanical, architecture,—than all the remainder of the universe in six thousand years.—*Walter Savage Landor.*